ARMY AVIATION DIGEST

ARMY AVIATION SCHOOL
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ARMY AVIATION SCHOOL

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DIGEST

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COVER: Bell's XV-3, an aircraft which operates like a helicopter when taking off and landing, and as a fixed wing airplane while cruising, is one of the latest additions to the aeronautical field. For additional information, see page 18.

This copy is not for sale. It is intended for more than one reader.

PLEASE READ IT AND PASS IT ALONG

WARRANT OFFICER APPOINTMENTS OPEN FOR ENLISTED PILOTS

Qualified enlisted personnel who have held the MOS of 1066, Helicopter Pilot, are eligible for appointment as warrant officers. The following paragraphs have been extracted from D/A Circular 134, 30 Nov. 1954:

"*2. The Department of the Army plans to appoint additional warrant officers with concurrent orders to active duty in the following Military Occupational Specialties for the remainder of fiscal years 1955 and 1956.*

MOS	*Job Description*
1066	*Helicopter Pilot*

"*3. Notwithstanding the provisions of paragraph 2a, SR 140–106–1, applications may be submitted by individuals for appointment as warrant officers with concurrent orders to active duty in the MOS's listed in paragraph 2, under authority of this circular.*

"*4. Applications will be submitted and processed in accordance with SR 140–106–1, except that all qualified enlisted personnel currently serving on active duty in any grade down to and including E–3, will be encouraged to submit applications for appointment as warrant officers, provided such individuals are fully qualified.*

"*5. Individuals who hold appointments as Reserve commissioned officers who submit applications for appointment and concurrent active duty, will, if otherwise qualified, be appointed temporary AUS warrant officers in order that they may retain their appointments as Reserve commissioned officers.*

"*8. Commanders are enjoined to encourage the submission of applications by all qualified personnel. It is necessary that expeditious handling at all echelons be emphasized to vitalize and maintain this program.*

"*9. Where there are conflicts with outstanding instructions dated prior to this circular, the provisions of this circular will apply.*"

Army circulars which supplement the instructions of the above circular are being published. Individuals should obtain copies of the supplementary circulars published by their respective army headquarters for complete information concerning submission of applications.

THE COMMANDANT'S COLUMN

Brigadier General Carl I. Hutton, *USA*

The views expressed in this article are the author's and are not necessarily those of the Department of the Army.—The Editor

Interdiction And Close Support

Interdiction and close support are very distant cousins. The theory that it is better to destroy an enemy tank 100 miles beyond the battle zone than it is to destroy it upon the battlefield really begs the question. In battle we are concerned with what is now on the battlefield. Our object is to defeat the enemy forces, and the destruction of the enemy's materiel is only incidental to the main object.

Our tactical theory is based upon the combination of fire and movement. On the battlefield fire without movement is wasteful, and movement without fire is suicidal. Close support is of value as a part of the fire element only to the extent that it is coordinated with movement. Movement is the more difficult of the two. The pace and timing of fire depend upon the rate of movement upon the ground. The rolling barrages of World War I were actually an attempt to force movement to conform with fire. The rolling barrage was abandoned because it was invariably either too fast or too slow for the movement on the ground. The trouble lay in the attempt to force the less flexible element to match the more flexible.

Interdiction is almost a by-product of the tactical air effort. It belongs properly to the Air Force because of this and because it can be accomplished with standard Air Force equipment. The interruption of communications, the attainment of air superiority, and the strategic bombing effort all contribute to interdiction.

Close support by analogy should be an Army function. It is an integral part of the ground battle, and it must be completely responsive to the will of the commander. Aircraft for this mission do not duplicate the tactical aircraft of the Air

Force. When the commander plans his operation, he adjusts his movement plan to take advantage of the available fire power, and he plans the application of fire power to increase the likelihood of successful movement. He cannot plan effectively if the fire power is to be available on a contingency basis. We would not think of telling him: "You will have an artillery preparation from H minus 60 to H–hour, if the artillery is not busy doing something else."

The distinction between interdiction and close support has gradually become apparent through combat experience and through the natural development of the Air Force in the direction of the strategic air war. It is a logical demarcation and provides a clear cut division of responsibility. Confusion and bickering have marked the attempts to make the present system work. A revision of the functions to confirm the Air Force's dominance in the interdiction role and to establish the Army's dominance in the close support role would end the confusion and the bickering.

. *This is the second in a series of columns written by Brigadier General Carl I. Hutton for the ARMY AVIATION DIGEST. General Hutton is Commandant of The Army Aviation School and Commanding General of The Army Aviation Center, Camp Rucker, Alabama. He is a graduate of the United States Military Academy and the National War College. He has also completed the Basic and Advanced Field Artillery Courses in The Artillery School and is a qualified fixed and rotary wing pilot.*

Upon graduation from USMA in 1930 he was assigned to the field artillery branch for six years of troop duty. From 1936 to 1942 he served in the Quartermaster Corps. In 1943 he returned to the field artillery to command the 96th Armored Field Artillery Battalion. In March 1944 he was transferred to the command of the 14th Armored Field Artillery Battalion which entered combat in Europe a short time later. In August of 1944 he became Commanding Officer of the 2d Armored Division Artillery, a command which he held until September 1946.

During the period between World War II and the Korean War he was Post Commander of Fort Hood; Director, Department of Air Training, The Artillery School; and G–4 for The Artillery Center. During the Korean War he served as Commanding Officer of the 24th Infantry Division Artillery.—The Editor

INSTRUMENT FLYING

Lieutenant Colonel Frank G. Forrest, *GS*

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor

Whether or not Army Aviators should be instrument qualified has been a controversial question for several years. Today, the attitude of the Army relative to this matter is reflected by the instrument training program being carried on at The Army Aviation School, and by the activities of the Instrument Examining Board established in each Continental Army and major overseas command. Every Army pilot is urged to become instrument qualified because by doing so he increases his capabilities and value to the Army as a military aviator. An example of why this is true may be learned by the following typical incident:

An Army pilot, non–instrument qualified, is on a cross-country hop in an L–17 or L–20. He RON's at San Francisco, or St. Louis, or San Antonio, or any one of many places where, during certain seasons of the year, haze and smoke, in which the visibility is less than three miles, hang over the airport until ten o'clock in the morning and sometimes until noon. This story would be pointless if these conditions did not exist at 0800 the next morning when this 3–3 pilot has to take off to keep his schedule, so let us assume the weather sequence at this hour reads thin obscurement, visibility two miles, fog, and smoke. The destination, however, is CAVU, and is forecast to remain clear for the next 24 hours. However, this aviator is temporarily grounded because Military Flight Service will not clear him until the required three miles minimum for VFR flights exists. The simple possession of an instrument rating, on the other hand, would permit this pilot to take off under these conditions, climb a few hundred feet, get on top of the haze and mist, and be on his way.

An argument against Army aviators becoming instrument qualified is that certain individuals will fail to realize

their limitations and, therefore, are likely to become involved in severe and dangerous weather conditions. In actual practice, however, the facts have not borne out this argument. On the other hand, non–instrument qualified aviators continue to become involved in weather conditions which they cannot handle. By becoming instrument rated, the Army aviator actually obtains a shield against unexpectedly encountering instrument weather which is one of the hazards of day–in and day–out flying.

Instrument flight training is much more than learning to maintain a desired direction and attitude of flight by the sole reference to instruments. It also involves a comprehensive study of weather flying. Each of these phases is as important as the other. The training and knowledge an aviator acquires in becoming an instrument pilot prepares him properly to evaluate weather; he learns what to look for, and becomes acquainted with the method of determining if a proposed flight can be executed safely. It may well be stated that an Army aviator owes it to himself and to the service to become instrument qualified.

The possession of an instrument rating does not mean that the Army pilot will never be grounded because of weather, but it will enable him to conduct many flights safely which otherwise would have been beyond his capability. Often a take–off can be made under weather conditions, which on the surface appear to be miserable, but an over–the–top condition may exist a few thousand feet high. The joy and excitement of flight on top of an overcast in itself is worth the work of becoming instrument qualified. This fascinating experience is further heightened when the pilot executes a well–performed let–down and landing at his destination.

Lieutenant Colonel Frank G. Forrest is the Army Aviation Officer, G3, CONARC. During World War II, he was Commandant of the Alaska Mountain Training School. From 1949–50 he was Supervisor of Instruction, Air Training Department, The Artillery School. He served as X Corps Aviation Officer in Korea in 1952 until his rotation to his present position in 1953.

Colonel Forrest has logged over 3100 hours and is qualified in all types of Army aircraft, including single and multi–engine fixed wing and rotary wing. He is instrument rated and holds a commercial pilot's license.—The Editor

How does an Army aviator go about becoming instrument qualified? There are several methods. The one most preferred, of course, is to be assigned one of the quotas to the instrument flight course at The Army Aviation School. There are 25 quotas allocated among the various Continental Armies every month. However, this falls far short of providing an opportunity for every aviator, and the backlog is building up every day. The Army pilot who finds that he is unable to attend The Army Aviation School Instrument Course can obtain his instrument rating by becoming qualified on his own initiative and taking the examination administered by the Instrument Examining Board of the Army area in which he is stationed. Further, a non–resident instruction course will be established soon at The Army Aviation School. Many Army pilots have become instrument rated by attending ground school at Air Force Bases or Naval Air Stations and practicing in their own unit aircraft. It may take a long while to do it this way, but it works. A well–conducted unit training program in instrument flying should enable many Army aviators to acquire instrument cards.

By way of aiding the newly instrument qualified Army aviator, a discussion of certain instrument flight practices is helpful. There are undoubtedly many aspects of instrument flight which the author has yet to learn by actual encounter. Nevertheless, here are some tips as he knows them!

Flight Tips

As previously indicated, the ability of a pilot to determine whether or not a flight can be made safely is one of the important keys to instrument flying. This evaluation will take into consideration the weather, available navigational facilities, and the capabilities of the aircraft which is used. When looking at the weather, find out if there are conditions which may cause structural damage to the airframe such as severe turbulence or heavy precipitation. Both may occur by flying through thunderstorms or cumulo–nimbus clouds at any time of the year. If these conditions cannot be avoided by circumnavigation, as will happen when a cold front is encountered, stay on the ground.

Determine if ice accretion will occur. Any time you are in the clouds, and the outside temperature is below freezing, expect to encounter ice. It will occur in various forms and

(1) POSITION	(6) DISTANCE	(11) TIME (ESTIMATED)	(16) ETA	(21) ATA
(2) PLACE OF TAKE-OFF	(7) —	(12) —	(17) —	(22) 1000
(3) CHECK PT #1	(8) 40	(13) 0 +17	(18) 1017	(23) 1016
(4) CHECK PT #2	(9) 80/120	(14) 0+29	(19) 1045	(24) 1044
(5) DESTINATION	(10) 65/185	(15) 0+23	(20) 1107	(25) 1107

Figure 1

in different intensities, but it will be there. With present Army aircraft, do not fly above the freezing level in the overcast. If the flight cannot be accomplished without doing that, stay on the ground.

Learn what the direction and intensity of the wind is at the altitude to be flown. This factor will influence the distances that can be flown without landing. With Army aircraft having from four and one–half hours to five hours of fuel, and with the requirement for being able to reach an alternate airport with 30 minutes reserve, wind is an important factor to the Army aviator.

If it is determined that the state of the weather enroute will not hinder making the flight safely, that the proper navigational facilities are available, and that the aircraft to be flown is capable of making the flight, the next step is to make a flight plan. This plan should contain a flight log. Flight logs get complicated, if you let them, which often results in their being used improperly or abandoned. The flight log, Figure 1 above, when used in conjunction with the radio facilities chart, has been found to be quite adequate. Boxes (1) through (11), (13), (16), and (21) are filled in before take–off. As soon as practical after take–off, fill in (22) and (18). Upon passing over check point #1, place the time in box (23) and determine the average ground speed for the first

leg. Depending on the length of time to make the climb to cruising altitude and the airspeed during the climb, estimate the ground speed when passing over check point #1. Based on this estimate, compute time to complete the second leg and fill in boxes (14) and (19). The ATA over check point #2 will give accurate information for computing ground speed being made. Unless there is a change of altitude, direction, or in wind, this information will serve as a basis to make computation for filling in boxes (15) and (20). On a long flight with many check points, this process continues until the final check point is reached.

If time permits, and the facilities are available, the position of the aircraft should be checked as often as possible. This may be done by determining when the path of flight, along a given track, intersects legs or radials of radio facilities on the flanks of the route. The best facility for this purpose is an omni station. After having determined the gyro heading to make good a given track, tune in the station on the flank, identify it, and rotate the course selector until the localizer (left—right) needle is centered. Note the time. A sectional or regional chart should be used in connection with this process. Refer to this chart and draw a line through the center of the omni station which intersects the compass rose around the omni station at a point which is the same as the reading on the course selector. Where this line intersects your track is your position. Best results are obtained if the bearings of two omni stations are taken in rapid succession. The center of the triangle formed by the two lines on the bearing from the two stations and the line representing the track is your position. The position on a certain course may be determined also by noting when you cross a leg of a four course low frequency radio range which intersects your route.

These frequent position checks are for the purpose of keeping your progress along the intended course up–to–the–minute. The flight log need not reflect every check. For these position checks an automatic pilot is badly needed to hold the plane's altitude and course while the paperwork is being accomplished.

One of the first things that will impress the new instrument pilot when making his first few actual weather flights is the importance of adequate voice communications. The feeling of loneliness when you are in the clouds, especially at

night, is dispelled almost immediately by that friendly voice on the ground giving you directions, aid, and information. The new 3–2 will become aware also that the handling of that "mike" is just as difficult as keeping the airplane straight and level. As he listens to the communication traffic on the airways, he can easily pick out the people who know their business by the way they sound over the air. Incidentally, military pilots and particularly Army pilots are notoriously poor when it comes to voice communications. Many of us use too many words and do not follow the proper sequence of requesting or giving information. Study the manuals on proper voice procedure and pride yourself that you use your radio "by the book."

Single vs Multi

A highly controversial issue relative to instrument flight is the importance of having multi-engine aircraft when flying actual instruments as opposed to using a single engine plane. There are arguments to support either point of view. For instance, all airlines use multi-engine aircraft. The Navy has been conducting instrument flight with single engine aircraft for years. After considerable research on the matter, the Air Force drew the conclusion that a multi-engine aircraft does not necessarily mean increased safety. In some cases, it is just the opposite because of the increased complication of the aircraft. In order to give an inkling of the relative importance of two or more engines for instrument flying as compared to other features of an aircraft, assume there are two airplanes available for a flight that must be conducted IFR. One is "A," a twin engine ship and the other, "B," is a single engine ship. Each has a complete set of identical communication and navigation equipment. The ceiling at destination is 800 feet, freezing level enroute is 3000 feet, and the minimum altitude for a portion of the flight is 3000 feet. Only "B," the single engine ship, has wing and propeller deicing equipment. Which airplane would you select? Naturally, "B" and the deicing equipment.

Of the various Army aircraft, the L–23 is undoubtedly the best for instrument flight. However, this situation is not attributed primarily to the fact that the L–23 is twin engine. It is true because the L–23 has the best communication equipment and is the fastest.

Thus far the discussion has been limited to consideration of instrument flight by airplanes. What about helicopters? Can they be flown on instruments? The answer is yes, but the problem is not as simple as it is with an airplane. Through the efforts of certain groups in the country, working independently of each other, the art of helicopter instrument flight has reached the point where it can be exploited.

When flying helicopters on instruments, information of what the helicopter is doing needs to be presented in more detail than the instruments which airplanes use are capable of showing. This situation exists because a helicopter rotor is not attached rigidly to the fuselage like the wing of an airplane, but, like the control surfaces of an airplane, the rotor controls the direction and attitude of flight. The instruments in each case, however, are mounted in the fuselage. It can be seen, therefore, that the airplane does not have the same problem as the helicopter whose fuselage is constantly lagging behind the tilt of the rotor. In addition, the helicopter flies slower than the airplane. Hence, a slight degree of bank gives a much greater degree of turn than the same degree of bank by an airplane. These problems are overcome essentially by providing the helicopter pilot with an instrument that gives him more information in a single glance than can be obtained from any of the instruments used in an airplane. This instrument is called a flight director and is similar to the Sperry Zero Reader. Experiments in helicopter instrument flying which have been conducted in the past few years have demonstrated that if the airspeed is kept above 40 MPH and the instruments described above are used, instrument flight in helicopters is quite practical.

Future

The foregoing discussion has been for the purpose of generating in the non–instrument qualified Army aviator an interest in this training, and it is hoped you 3–2's, 2–2's, etc., were able to compare a few notes. However, it has not been proved that it is absolutely required for Army aviators to be instrument qualified. Today it is not, tomorrow it will be. Army aviation offers a great potential which to date has been exploited only partially. In the field of reconnaissance and surveillance we have, in the past, been (*Continued on page 37*)

FROM HORSES TO HELICOPTERS

Lieutenant Colonel G. H. Shea, *Transportation Corps*

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor

At Fort Riley, Kansas, the historic home of the famous Cavalry School of yesteryear, the legendary traditions of "Garry Owen" are being revived with a transition from horses to helicopters. The once familiar sight of the Cavalry troopers riding the rim–rock surrounding this old Army post has been replaced by squadrons of U. S. Army helicopters darting over the landscape. This has become the training ground for the H–21 cargo helicopter, the "Workhorse" of the fast growing family of transport helicopters.

The H–21 is more affectionately known as the "Flying Banana" for obvious reasons. It has the distinction of being the largest helicopter in service today. As a transport aircraft, capable of displacing troops swiftly from one area to another without the aid of airfields, it is an essential vehicle to our fast moving modern Army. With this objective in

mind, the 71st Transportation Helicopter Battalion is currently conducting transition training for Army aviators in this aircraft in order to assure the expert piloting necessary to move our forces safely into their battle positions.

The interior of the "21" is large and businesslike, readily accessible for either troop or cargo loading, and, although it might be called the C–47 of the helicopter family, it has many additional outstanding features. The tandem rotor system permits a wide latitude in cargo placement and contributes to smooth flying control in cross–wind conditions. In the pilot's compartment you will find an orderly arrangement of engine and flight instruments with easy–to–reach switches and easy–to–read indicators. The flight controls are naturally comfortable with finger tip accessory trip switches built into the hand grips. A sensitive cyclic control allows precision directional movement of this heavy transport, and its collective pitch control seems to be the only restraining arm against the power available to the pilot. This helicopter has plenty of power to pick up and pull out the payload. Its excellent autorotative characteristics are a big dividend to the pilot in distress as a straight–in autorotation may be handled with the same ease and sureness of a normal approach. The vibration level, characteristically inherent in all helicopters, is noticeably low to the pilot first flying the aircraft. Even the servicing of such a large aircraft is made easy with the convenient accesses to the engine and inspection areas.

Perhaps the most striking sensation first noticed by the pilot flying the H–21 is the realization that the main gear and tail cone are so far aft of his position. It usually takes a few

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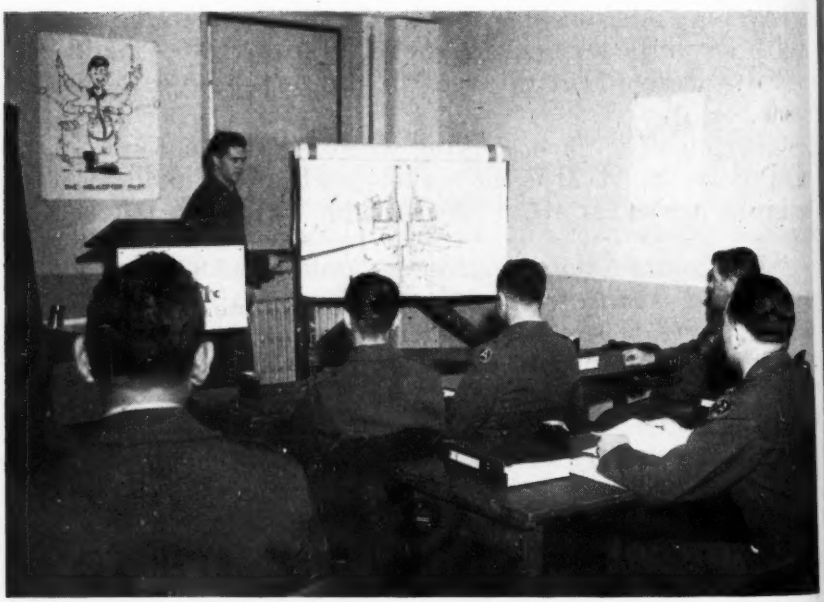
Lieutenant Colonel Gerald H. Shea is Commanding Officer of the 71st Transportation Helicopter Battalion, Fort Riley, Kansas. He received his AB degree from the University of Hawaii in 1941 and is a graduate of the Advanced Course at the Armored School, of the Regular Course of the Air University, Maxwell Air Force Base, and of the Special Weapons Course at the Command and General Staff College. During the Korean War he was Tenth Corps Aviation Officer and Commanding Officer of the Eighth Army Flight Detachment. He is a senior pilot, qualified in all types of Army helicopters and single–engine, fixed–wing aircraft.—The Editor

Army Aviators receiving H–21 Transition Flight training at Fort Riley are given instruction in handling of cargo, above, in addition to classroom instruction, below, on the aircraft's power, electrical, and control system.



flying hours to acquire an awareness of the aircraft's length and gain the pilot's perception of knowing just where and when the gear will touch. Once this feeling is attained, the pilot knows he has under control the largest outside elevator in the business. The stability of this rotor–ship is largely attributed to its twin–rotor system, and this factor becomes increasingly important at night while hovering when reference points become lost in the darkness.

Night Flight

There are no unusual adversities in flying this aircraft at night as its internal and external lighting facilities are most adequate for night operations. The visibility of the pilot is slightly restricted by the instrument panel during a night approach/descent to a spot; however, the copilot has full forward and downward vision, and the pilot does have the aid of a full directional external searchlight together with a large flood light under the fuselage which provides the ground crew with ample lighting for hooking up an external sling load.

Suspension Loading

Again, the excellent stability of the ship while hovering is an important time saving factor in hooking onto a load. After the hook is locked onto the load, and the signal to lift is given by the crew chief over the intercom, this same stability allows the pilot to make a vertical "clean jerk" thereby minimizing the roll of the ship and pendulous swing of the airborne load. The four point suspension of the sling permits a smooth translation from hover to climb–out with the external load; however, the permissible forward speed varies with the type of load. The twisting of the suspended load presents changing drag surfaces which are continuously transmitting forces to the balance of the aircraft, so as the speed is increased, the force of these drag coefficients increase causing greater countercontrol technique.

The use of either the sling or the hoist requires greater reliance by the pilot upon the crew chief. He must accompany the ship on every flight so that he can act as both the eyes and ears for the pilot in the troop compartment.

Aviators reporting for transition flight training to Marshall Army Airfield at Fort Riley will find complete facilities on the base. Billeting and messing arrangements are provided at the field as well as classrooms, recreation, and medical facilities. Initial processing provides the flying officer with the necessary equipment and publications for the course. After a check-over by the flight surgeon at the airfield dispensary, he reports to the ramp for a familiarization flight in the H-25. The purpose of this flight is to let the pilot get the feel of flying a tandem rotor helicopter prior to going up in the big "21." After this flight he is introduced to his flight instructor who in turn introduces him to the H-21.

During the three week course he will notice a close resemblance to his previous training at The Army Aviation School, as many of the approved procedures used there have been incorporated in this course.

Both scheduled and "pop" examinations are given throughout the course in all aspects of training to test the amount of instruction retained. The transition pilot is given 80 hours of maintenance instruction, in addition to his flight instruction, to assure a complete familiarization with the aircraft power, electrical, and control systems. Experienced instructors, trained at the Piasecki Helicopter Corporation, make this portion of the course interesting as well as informative through the use of mechanical training aids, exploded view charts, and actual demonstration on the aircraft itself.

Cruise Control

It is axiomatic that today's Army aviator must know the aircraft in which he flys. For this reason, the subject of Cruise Control is emphasized for the H-21 since its effectiveness depends upon the amount of useful weight which it can carry a given distance. The computation of the allowable fuel weight to be taken aboard, and the control settings that will consume this fuel, must be carefully ascertained beforehand in order to assure the success of the mission.

Flight

Flying the H-21 occupies most of the time allotted to the course. From the day the aviator first takes over the controls until he receives his graduation qualification card he must

complete a minimum of 25 hours as first pilot. All of this flying time is conducted under the supervision of his instructor who coaches him through each of the standard maneuvers until he can execute them with precision. Perhaps the maneuver remembered best by those who have already completed the course is the 180 degree autorotation off the rim–rock ledge onto the airfield. It is a real challenge to any aviator's airmanship to drop a 13,000 pound aircraft onto a spot below him with a complete change in direction and without the aid of power. Maneuvers such as this are practiced over and over during transition training in order to assure a successful landing in the event of a power failure in flight.

When the pilot begins to feel secure at the controls he is trained to hover over a cargo load by following the hand signals of a ground crewman. He then starts to pick up various sized loads with the external sling until he learns to handle the large 2,000 pound packing crate load.

He must also learn to get into and out of confined areas safely, always using the best advantage of power settings for the situation at hand.

Tactical Operation

After the pilot acquires an awareness of the extreme size of the helicopter, he then progresses to pinnacle landings and to low–level, cross–country navigation, both in daylight and at night. The tactical operation of this helicopter often may require hilltop flying to conceal the movement of troops from enemy observation. Because the helicopter is ideally suited to the performance of mercy missions, the course includes a demonstration of litter stowage for the evacuation of wounded personnel, and a lesson in fishing with the rescue hoist used for retrieving personnel or cargo whenever a landing is impossible. With all the work, coordination, and studying required during this transition training, it becomes a great sense of satisfaction to each pilot to be able to fly the H–21.

Maintenance Support

In support of the H–21 transition course are the men and aircraft of the 93rd Transportation (*Continued on page 35*)

BELL XV-3

In 1951, Bell was one of three companies awarded a joint Army–Air Force contract for the development of a practical convertiplane for the Army. The contract was divided into two categories, Phase I and II. Under the Phase I portion of the program, Bell devoted its efforts to engineering problems and theory for the most part. Following the successful completion of the Phase I program, a Phase II letter of contract was awarded for the Bell XH–33 (later redesignated XV–3) convertiplane which covered further development, prototype construction, and testing. The XV–3 convertiplane is an aircraft designed to combine the hovering and vertical flight capabilities of the helicopter with the high cruising speed and long range (compared to the helicopter) performance of the airplane. Twin, three–bladed rotors are mounted near the tips of a relatively small wing. The rotor mast axis is vertical for helicopter operation.

After a basic speed is reached, the masts are tilted forward, through approximately 90 degrees, until they are horizontal and the rotors are acting as propellers. During this conversion process, which requires 10 to 15 seconds, the lift load is transferred from the rotors to the wing. After conversion, a transmission gear shift similar to a automobile overdrive is used to reduce rotor speed and, thereby, attain improved high–speed performance.

There are no abrupt changes in altitude or flight characteristics during conversion and the pilot retains full control at all times. Further, there is no loss of altitude and the operation can be made while the craft is maintaining a steady climb. In case of engine failure during the airplane operation, power–off conversion back to helicopter configuration can be made and then the craft merely makes a helicopter autorotation landing.

The three-bladed rotor-propellers mounted near the tips of the XV-3 wing (above) operate as conventional lifting rotors during take-offs and landings and as airplane propellers for cruise and high speed flight (below).

Four basic design concepts guided Bell Aircraft's convertiplane development. These concepts were: primary cause of helicopter forward flight; concentration of efforts on a design which is free of inherent speed or size limitations; to minimize costs and functional and weight economy. Major elements of the convertiplane are utilized in both helicopter and airplane flight (with very few exceptions), and proven design elements have been used throughout in order to minimize the development difficulties which might otherwise be expected.

In the same way that cavalry units of the pre–tank era were limited to what the horse could do, all missions performed by Army helicopters are restricted by the performance limitations of helicopters. Recognizing this drawback, the Army convertiplane program was initiated. With the development of practical type convertiplanes, the Army is in effect developing a new type "steed" tailored to today's logistical tactical needs.

The tilting–rotor type convertiplane, capable of vertical take–off and landing coupled with considerable operational radius, contains the element of surprise because of its speed. Speed also enables troops to be moved more safely by decreasing the time the transport is subjected to enemy fire when approaching the objective, and makes possible more round trips per vehicle in any given period.

In its present configuration, the XV–3 is a four–place observation–reconnaissance aircraft or a two–place (pilot, medical attendant) evacuation–rescue craft with litter accommodations for two patients. It is suitable for transporting men, equipment, and supplies within the combat zone in addition to its primary missions of observation and reconnaissance, with delivery to the point of tactical use. Other potential uses for convertiplanes are as reinforcement, resupply, relief, and rescue aircraft for isolated or surrounded troops.

Exhaustive "tie–down" ground tests are scheduled for the XV–3 convertiplane at the Bell Aircraft plant before actual flight tests begin. Besides collecting valuable engineering data, ground tests enable the pilots to become thoroughly familiar with the operation of the new "bird" prior to leaving the ground.

ARMY AVIATION IN THE DARK

Captain Weyman S. Carver, *Artillery*

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor

Captain Melvin W. Rorick, a member of the Seventh Infantry Division Aviation Section in Korea during 1953, with the help of nine volunteer pilots and observers, proved that not only can Army light aircraft fly at night but that there is definitely a need for them. At night, as in the daylight hours, they help fill the gap between the Infantry and the Air Force.

The idea of the Army night flying in combat operations was conceived by Captain Rorick in November 1952, shortly after his arrival in Korea. While on routine observation missions, he noted that just prior to darkness he could pick up enemy artillery flashes which he could not see earlier in the day. He requested permission to experiment with night flying but was refused for several reasons. First, night flying had been experimented with by the Army in Korea before and these experiments had not been too successful. Due to the results of these experiments, the majority of Army aviators felt that it was not possible to conduct precision registration of artillery fires at night, that you could not see enough at night to gather G–2 information, that the Air Force adequately supplied illumination missions, and therefore, there was no need for Army night flying. Further, they did not think it safe to attempt night flying with the type of equipment available.

In December 1952, the division went into reserve for a short period. During this period in reserve, Captain Rorick investigated the experiments which had been conducted in night flying by the Army in Korea and came to the conclusion that they had not been conducted over a long enough period, that the possibilities of night flying had not been investigated fully, and perhaps most important, that night

flying operations could be safely conducted with very little additional equipment above that authorized by the T/O&E.

When the division returned to the line in the latter part of December, Captain Rorick had himself appointed as special projects officer of the aviation section. Next, he obtained permission to conduct occasional night flights. Throughout the first half of January 1953, he flew nightly, perfecting safety methods, means of obtaining G–2 information, and methods of conducting artillery fire.

In the latter part of January, Major Raymond Evers, Seventh Infantry Division Air Officer, obtained permission from Headquarters, Eighth Army Aviation, to conduct a sixty–day experiment of round–the–clock flying. On the night of 25 January 1953, this experiment was begun by Captain Rorick, four other pilots, and five observers, all volunteers. During the experiment, which lasted from 25 January 1953 to 1 April 1953, slightly more than sixty days, 243 combat missions were flown for a total of 415 flying hours. The potentialities of artillery adjustment, information collection, and flare illumination were investigated during the period with results ranging from poor to excellent.

Equipment for the experiment consisted of three L–19 type aircraft, one L–20 type aircraft, fourteen flare pots, one one–quarter and one three–quarter ton truck, and one searchlight. The personnel consisted of five pilots, five observers, and ten enlisted men. The enlisted men were assigned as follows: three mechanics, one radio operator, one tower operator, one alert man, and a four–man searchlight crew.

Pilots were carefully selected with a primary requirement that they be proficient in instrument flying, and secondly, that they be thoroughly familiar with the division sector. The airstrip, approximately sixteen hundred feet long, was outlined with flare pots. Flare pots were also placed on tops of surrounding hills since the strip was in a valley. Another safety measure was the installation of a searchlight at the end of the runway to assist in lighting the strip and for use as an orientation marker.

It was found that it takes a minimum of ten nights of flying before a pilot and observer team may be expected to produce satisfactory results. During the first nights of flying, the pilot rides as an observer with an experienced night pilot and learns what to look for. For example, the only means of

judging distance at night is by lights and these will vary in intensity both with atmospheric conditions and distance. Therefore, considerable experience is required before a pilot becomes adept in estimating distance. Also the problem of orientation at night, especially on dark nights when the moon is not shining, depends largely on lights. On moonlight nights, streams, rivers, hills, and land masses make excellent orientation aids. During dark nights, particularly over the front in Korea where the experiment was conducted, the only lights were those made by bursting shells and streams of tracers, and the pilots had to rely on their instruments and the searchlight beam back at the airstrip. However, it was found that the pilots had no trouble with orientation after approximately four hours of night flying in the sector.

The information collection phase of night flying was the first phase which was experimented with. First, a pilot must be taught what he is seeing. For example, during the daytime, vehicles are identified and counted by their shape, size, and number. At night there is nothing but lights to look at and a pilot must know whether he is looking at a vehicle's headlights or a stationary light in a building. A mistake of this type is very possible since during a dark night there is no horizon or other means of telling if the plane is in level flight other than the instruments in the plane. Thus, a pilot may be looking at a light on the ground, have his aircraft in a slight bank, and seemingly the light is moving over the ground. Actually the aircraft is moving around the light.

Collection of information at night, with the exception of that which can be picked up due to lights, is very limited. With the use of flares, collection of information is greatly increased. The expense of such an operation must be considered in relation to the value of the information obtained.

It was found that spotting of enemy artillery areas was very simple by observing the flashes from the guns. This information is extremely valuable in that a prepared counter-battery program may be put into effect.

Attempts were made at precision destruction of enemy vehicles and supply areas. When flares were used to provide continuous illumination, destruction missions were successfully fired.

For many years the Air Force has illuminated the battlefield by dropping flares from aircraft and they have always

battled the problems of time and accuracy. The Infantry often complains that too much time elapses from the time they call for illumination until the Air Force can get a high performance aircraft, one capable of hauling sufficient flares to provide a long period of illumination, over the area to be illuminated. For example, a cargo type aircraft must be used and, logically, must be based at a large air base in order to have adequate runways and maintenance facilities. It is not possible to establish such air bases close to the front lines even in a stable situation such as existed in Korea during the experiment. It would be particularly true in a fluid situation as it would be impossible to move forward with the Infantry. Thus, it is a physical impossibility for the Air Force to provide illumination within a few minutes after the Infantry requires it, unless a high performance aircraft is kept airborne at all times. This would be a very expensive method.

During the experiment, it was found that the first flare could be dropped over the front within an average of fifteen minutes after the request for illumination was received at the Army airstrip.

By using an L–20 type aircraft, enough flares were carried to provide continuous illumination for approximately seventy–five minutes. Since the average time, during the experiment, for the Air Force flare ship to reach the division sector after it had been called for was slightly over an hour, the Army aircraft was able to provide needed illumination until its arrival. Once the Air Force ship arrived in the sector, it coordinated with the Army aircraft which was already in the area to provide increased accuracy in dropping flares. For example, the Army aircraft traveled much slower and its pilot was familiar with every hill and stream in the area as well as the location of Infantry units. Therefore, he could pinpoint the area needing illumination. He would drop one flare as a marker, then the Air Force ship would drop several flares on the marking flare.

Through this night flying experiment, Army aviation greatly improved the bridge over the gap between the Infantryman in the fox hole and the high performance aircraft of the Air Force.

H-13 FLIGHT BY NIGHT

Owen Q. Niehaus

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor

For after–dark operations the pilot must have a thorough working knowledge of the best night flight techniques in order to accomplish successfully his mission with maximum safety and minimum difficulty. Low altitude flights, from the ground up to approximately 350 feet, may be conducted in the H–13 with the use of a landing light with little or no difficulty. However, when a pilot must conduct a flight at a higher altitude or without use of his landing light, he must depend on ground lights.

The Bell helicopters which are certificated for night flight are placarded to minimums of 700 feet ceiling and one mile visibility. These minimums provide a satisfactory margin of safety when visual flight is being conducted over lighted areas.

However, the pilot should use discretion in attempting flights under conditions of poor visibility when few ground light references exist since the H–13 is not provided with instrument flying equipment. A constant visual reference is needed to maintain fuselage attitude.

This does not mean that if a pilot were suddenly to lose all attitude reference that he would immediately lose control. By using the airspeed indicator, altimeter, and compass, it is possible to make 180 degree turns without too much difficulty.

Hovering

Hovering may be most satisfactorily accomplished by the use of a landing light with the light fixed to throw its beam down approximately 30 degrees from the horizontal. This provides an adequately lighted area immediately in front of the machine for reference and for observing obstructions.

The pilot conducting his first night flight will notice a tendency to drift while hovering, thus requiring additional attention to the maintenance of proper fuselage attitude. However, just as the pilot flying during daylight hours develops a subconscious response to attitude changes after a little practice, so will the pilot faced with the same problem at night.

Take–Offs

Take–offs can be made in the normal manner from a hover, but it is recommended that altitude be given priority over airspeed and that climbs from low altitudes be conducted at best rate of climb airspeed, approximately 45 mph, IAS.

Approaches

Approaches may also be made in the normal manner, but it is recommended that the last 100 feet or so be conducted at a slightly reducted airspeed and rate of descent so that additional time will be available to the pilot for determining his actual altitude above the ground. Close attention should be given to the airspeed indicator and the altimeter.

A general tendency exists for a neophyte pilot to approach the ground at too great a forward velocity and with a rate of descent that results in a situation requiring sudden and large control corrections. This is due to the failure of the pilot to recognize his proximity to the ground until too late. It is recommended that the landing light be used only during the latter portion of the approach. Premature lighting (about 300 feet) will result generally in a white hazy cone of light

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In World War II Owen Q. Niehaus served approximately four years with the Air Force during which time he logged over 700 hours in helicopters. Since his separation from active duty, he has been employed by Bell Aircraft Corporation, Fort Worth, Texas, as test pilot, test engineer, autopilot project engineer, and presently as electrical and electronic design group engineer. He is qualified in all types of Bell helicopters as well as single and multi–engine fixed wing aircraft. He has a commercial pilot's license with helicopter instructor and single and multi-engine land ratings.—The Editor

which is highly distracting and tends to reduce forward vision. This is particularly true when light fog or ground haze are present.

The pilot required to operate in a local area at night should make every attempt to be completely familiar with the terrain, since he may be called upon at any time to execute an emergency landing. Normal daytime emergency procedure may be followed, consistent with the use of the landing light, which may be used advantageously during the latter phase of the descent to observe obstructions and to select a clear landing area.

If at all possible, the pilot should limit the steepness of a cyclic flare, since he will lose ground reference once he has flared beyond the range or inclination angle of the light.

It may be well to list a few suggestions that a pilot faced with night flying may use to his advantage.

(a) Caution should be used in sideward and backward flight.

(b) The altimeter should be zeroed for local area flights and the settings checked frequently to increase the instrument's value as a reference.

(c) Cross–country flights should be conducted with sufficient altitude to assure safe clearance of all obstructions.

(d) Cockpit instrument panel lights should be kept at as low an output as possible to decrease contrast and improve the pilot's ground vision.

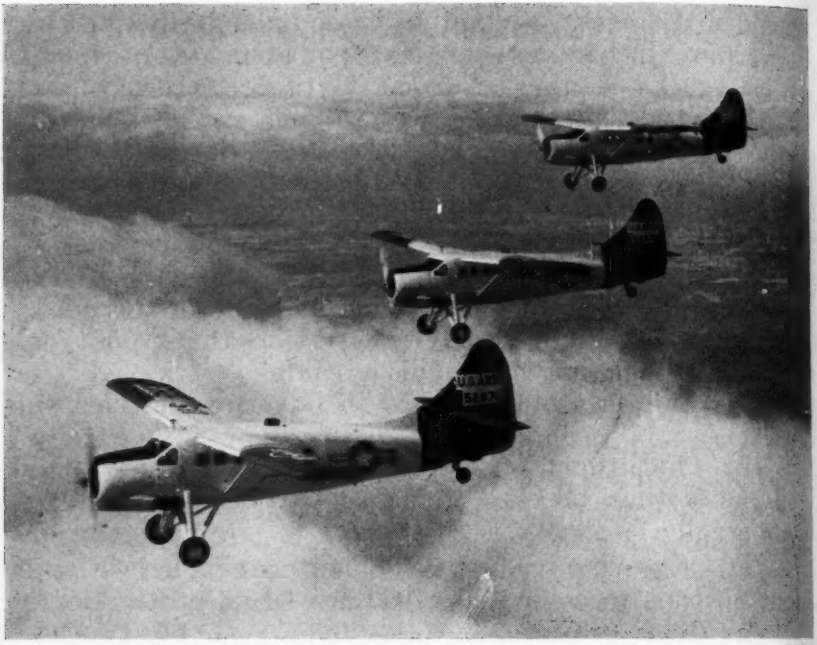
(e) Functional check of the lighting system should be made prior to take–off.

(f) Lights on the horizon are very deceptive as an indication of distance and relative motion. No two lights which are apparently lined up with your flight path should be used as attitude and drift references.

(g) Low altitude flight over level terrain can best be accomplished by "panning" with the landing light. This technique involves making mild turns and thus sending the beam back and forth, giving the pilot the complete picture of obstacles in a wide area in front of him.

The job of night flying for the helicopter pilot should be nothing more than a regular part of his work and should provide little cause for concern if he remains constantly alert and exercises faultless technique.

ARMY U-1



On 14 March 1955 Major General Lewis W. Prentiss, representing General Matthew B. Ridgeway, Chief of Staff, officially accepted for the U. S. Army the first six DHC-3 Otters, (U. S. Army designation U–1), of an order for 90. These first six, which were painted in the Arctic colors of white with red wing tips and tail sections, were delivered to the Corps of Engineers for use as supply aircraft on topographical survey operations in Alaska and the Caribbean area. Subsequent Otters will be delivered to Army aviation companies for use as supply aircraft in forward areas, transporting cargo, troops, and for the evacuation of wounded.

The Otter is the big brother to Army aviation's L–20 "Beaver". It has a wing span of 58′, a length of 41′ 10″, and a height of 12′ 7″. It is powered by a Pratt & Whitney Wasp R1340, geared, nine cylinder, air cooled, radial supercharged engine rated at 600 BHP, with a Gear ratio of 2.3.

The cabin (figure 2 below) is 5′ high, 5′ wide, and has an overall length of 16′ 5″. This provides a total volume of 345 cubic feet, and includes the rear storage compartment which is separated by a removable bulkhead. The cabin may be fitted with standard chairs to accommodate nine passengers (figure 3, page 30) or with military–type bench seats along the side walls to accommodate fourteen passengers. All seats

Figure 2

may be removed and replaced with litters (figure 4, page 30) or to provide maximum space for cargo.

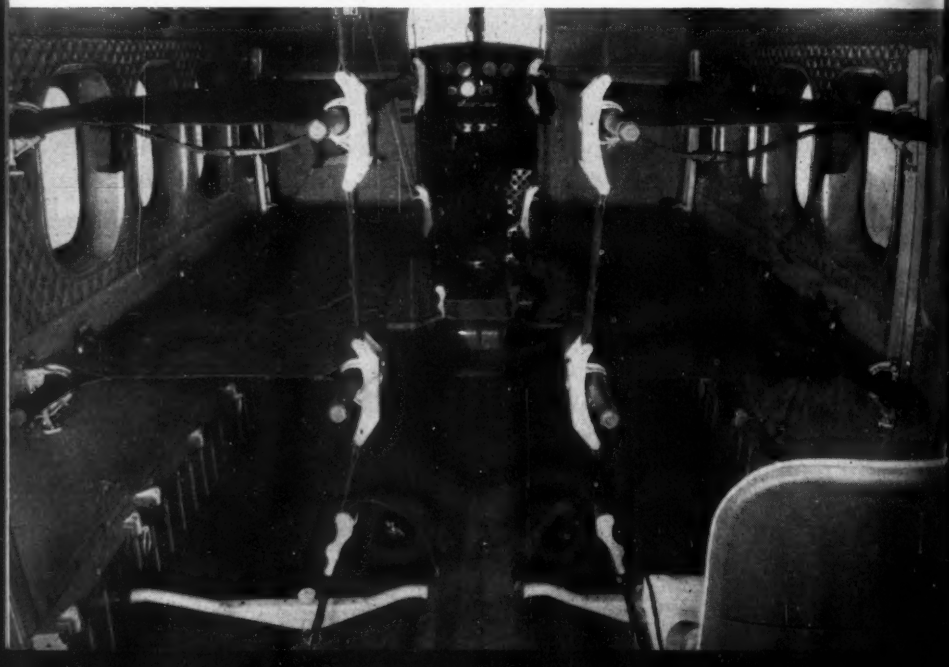
The ship has a double freight loading door on the left side which measures 46½″ wide by 45″ high. These doors may be removed to provide an opening for in–flight jettisoning of cargo. Additionally, there is a standard door on the right side of the cabin which is 30″x45″ and doors on both sides of the cockpit which permit entry and exit for the pilot and copilot when the cabin is loaded to capacity.

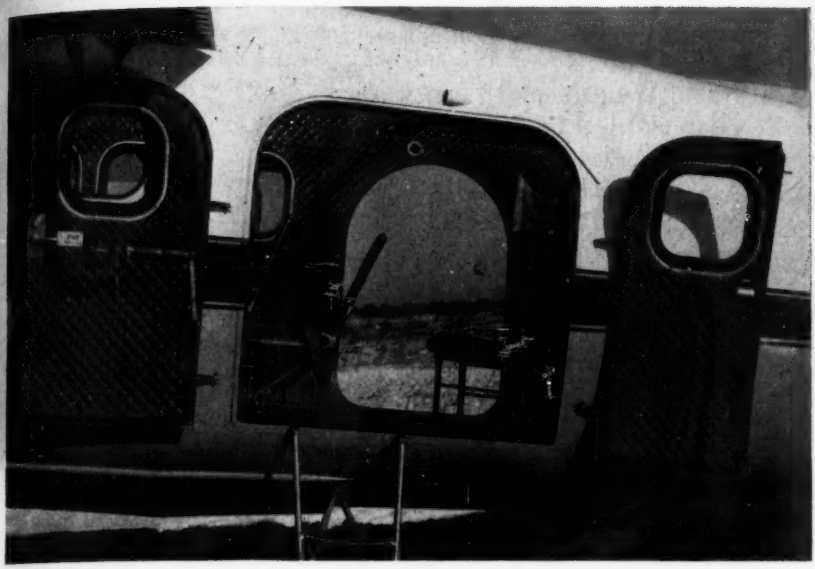
The all metal structure of the Otter has been designed to withstand severe operating conditions in remote areas and to

Figure 3

require a minimum of maintenance. Flexible fuel cells are positioned under the cabin floor and can be serviced or replaced through hatches in the lower belly skin. No ladders are required for servicing since fuel and oil fillers and all service points are readily accessible from the ground. The battery and radio equipment are installed to the rear of the main cabin in the storage compartment. The battery may be installed or removed without the aid of tools. For complete specifications, see page 32.

Figure 4





Double doors on the left side offer ready access for bulky cargo, above. Below, cockpit is spacious with wide passage between pilot's and copilot's seats.

Specifications

Basic Weight (with seats, radio, etc.)	4,358 lb.
Disposable Load	3,242 lb.
Gross Weight	7,600 lb.
Take–off (full load—zero wind)	600 ft.
Take–off (full load—10 mile wind)	480 ft.
Take–off (full load—20 mile wind)	360 ft.
Rate of climb (sea level)	1,100 ft./m.
Cruising Speed 5,000 ft.	139 mph.
Maximum Speed 5,000 ft.	160 mph.
Service Ceiling	19,000 ft.
Absolute Ceiling	20,500 ft.
Landing Roll	480 ft.
Stalling Speed (IAS)	45 mph.

Range

Maximum Range (no allowances)	1,068 miles
Fuel Capacity (normal tanks)	214 gals.
Oil Capacity	10.8 gals.

Endurance

Maximum Endurance 5,000 ft.	10.3 hrs.
Endurance at cruise power	7.1 hrs.

Payload

200 miles still air range	2,550 lbs.
500 miles still air range	2,310 lbs.
Maximum miles still air range	1,910 lbs.

"Contributing in important degree to the Army's mobility has been the development of Army aviation."

—General Matthew B. Ridgeway

VIBRATION IDENTIFICATION MODEL 47, H13, HTL

Joseph S. Dunne

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor

To eliminate a vibration you must first find it.

To find it (the easy way) you must identify it.

Vibrations are best identified by their frequency and the vibrations most common to the Bell Helicopter fall into three frequency groups:

I. Easy to Count (Approximately 5 per second)

Type 1. This vibration bounces you up and down. It generally grows more with increased airspeed. It is present in all maneuvers. (The Main Rotor is out of Track.)

Type 2. This vibration usually rocks you from side to side. Its intensity seldom varies throughout the speed range. (The Main Rotor is out of Balance.)

Type 3. This vibration is generally felt in the cyclic stick. It is not generally encountered in all maneuvers, but rather in those where fuselage attitude is being changed rapidly. (One Dynamic Stop Cable is too Short.)

Type 4. This vibration is felt in the cyclic stick. It is present in all maneuvers. (The Hub is Probably not Rigged Level.)

II. Too Fast to Count (Approximately 10 per second)

Type 1. This vibration is generally felt in cyclic stick. It is not generally encountered in all maneuvers, but rather in those where fuselage attitude is being changed rapidly. (Both Dynamic Stop Cables are too Short.)

Type 2. This vibration is generally felt in the fuselage.

It bounces you up and down.
It occurs in the 18 to 20 mph airspeed range. (THIS IS NORMAL) (It is caused by variations in downwash distribution, and is sometimes erroneously referred to as "sidewind.")

Type 3. This vibration is generally felt in the fuselage. It may occur in all maneuvers but is usually more pronounced during a roll in one particular direction. (THE ENGINE SPRAGGING MAY BE OUT OF ADJUSTMENT.)
Note: It is normal to feel this vibration when rolling to right or left.

III. HIGH FREQUENCY (Like a buzz)

Type 1. This vibration is generally felt in the fuselage . . sometimes in the rudder pedals.
It occurs only when hovering crosswind.
(THIS IS NORMAL) (It is caused by excessive flapping of the tail rotor blades, wherein they bottom against the rudder stops at the hub.)

Type 2. This vibration is generally felt in the fuselage . . sometimes in the rudder pedals.
It occurs in all maneuvers, although it sometimes varies with rudder displacement or with power.
This type vibration has many sources. There is, to date, no certain way to identify the frequency or any other characteristic. It is best attacked by a trial and error method of elimination of the following items in approximately this sequence:
Check universal joint.
Check tail rotor pitch change control links.
Check tail rotor track.
Check tail rotor flapping hinge bearing.

Joseph S. Dunne is Chief Experimental Test Pilot for the helicopter division of the Bell Aircraft Corporation, Fort Worth, Texas. He joined the Bell Corporation in January 1946, and participated in the formation of the Bell Helicopter Training School. In 1949 and 1950 he managed Bell's Oil Exploration Division. Since 1950 he has been doing experimental test pilot work.—The Editor

Check tail rotor drive shaft bearings.
Check tail rotor drive shaft alignment and "Run out."
Check end clearance at morflex coupling.
Check tail rotor balance.
Check tail rotor drive quill.
Check gears and bearings in 90° gear box.
Check fan drive quill.
Check fan bearings.

Note: A certain amount of high frequency vibration is normal to the helicopter, sometimes originating in the engine.

Do not be surprised to find an occasional vibration that cannot be typed by the above rules. We find them ourselves, but they are rare. The best approach in this case is to attempt a systematic elimination of the probable cause.

(*FROM HORSES TO HELICOPTERS continued from page 17*) Helicopter Company. It is their job, together with the men of the 80th Cargo Helicopter Field Maintenance Detachment and their heavy maintenance equipment, to keep the big ships ready on the flight line. With an accumulation of more than 1,300 flying hours on this new aircraft, all within a relatively short time, it is easily seen where the care and feeding of the "Workhorse" represents a sizable effort.

A fundamental objective in aviation helicopter training is the progressive graduation of helicopter qualified aviators from the reconnaissance to the utility type helicopter, and then to the cargo class rotorcraft. It is readily apparent that as the Army makes use of today's highly technical aircraft to gain mobility in the field and reconnaissance in the air, the soldier in the air must be an expert aviator. Accordingly, the H–21 transition training course is designed to assure the highest standards for qualification in this cargo–transport aircraft and to graduate only a thoroughly proficient military aviator. By developing the pilot's skill, knowledge, and responsibility in operating the H–21, he is more fully prepared to utilize its capabilities in the field, and the safe practices of flying standardization learned here are carried back to the operating units. Thus, this course, as an adjunct to the complete progressive aviation training program, assures a superior corps of Army aviators in support of the Army mission.

BOOKS FOR THE ARMY AVIATOR

AIRMAN'S ODYSSEY—
Saint Exupery, Antoine de. (Harcourt & Brace Co., Inc., 383 Madison Avenue, New York 17, N. Y., 1942. $5)—One of the few classics of aviation literature, by a French air hero of World War II.

THE CONQUEST OF EVEREST—
Hunt, Sir John. (E. P. Dutton, Inc., 300 Fourth Avenue, New York 10, N. Y., 1954. $6)—What Hunt describes was not only an epic of mountaineering, but also a model of military planning, organization, and execution.

GENERAL BILLY MITCHELL: CHAMPION OF AIR DEFENSE—
Burlingame, Roger. (McGraw-Hill Book Co., Inc., 330 W. 42d Street, New York 36, N. Y., 1952. $3)—A popular biography of the stormiest figure in the history of American military aviation.

MIRACLE AT KITTY HAWK: THE LETTERS OF WILBUR AND ORVILLE WRIGHT—
Kelly, Fred C., Ed. (Farrar, Straus, and Young, Inc., 101 5th Avenue, New York 11, N. Y., 1951. $6)—These letters make good reading.

THE SPIRIT OF ST. LOUIS—
Lindbergh, Charles A. (Charles Scribner's Sons, 597–599 5th Avenue, New York 17, N. Y., 1953. $5)—The Pulitzer Prize-winning story of the most famous exploit in aviation history.

ACK-ACK—
Pile, Sir Frederick. (British Book Centre, 420 W. 45th Street, New York 36, N. Y., 1949. $4.25)—Britain's wartime flak chief writes of the role played by AAA in the defense of the United Kingdom.

Beginning with this issue the ARMY AVIATION DIGEST will publish a recommended list of books for the Army aviator. The list will include selections from both the factual and the fictional fields of literature. In subsequent issues of the DIGEST, outstanding books will be reviewed by members of the staff and faculty of The Army Aviation School.—The Editor

CEILING UNLIMITED—
Morris, Lloyd, and Kendall Smith. (The MacMillan Co., 60 5th Avenue, New York 11, N. Y., 1953. $6.50)—A lively informal history of American aviation.

HOW OUR ARMY GREW WINGS—
Chandler, Charles De Forrest, and Frank P. Lahm. (The Ronald Press Co., 15 E. 26th Street, New York 10, N. Y., 1943. $3.75)—Two pioneers recount the story of the early years of American military aviation.

HISTORY OF MARINE CORPS AVIATION WORLD WAR II—
Sherrod, Robert. (Combat Forces Press, 1529 18th Street, NW, Washington 6, D. C., 1952. $6.50)—The author of this sound history was a TIME–LIFE correspondent in the Pacific during World War II.

HISTORY OF UNITED STATES NAVAL AVIATION—
Turnbull, Archibald D., and Clifford L. Lloyd. (Yale University Press, New Haven, Connecticut, 1949. $6)—The naval air arm from birth down to World War II. Has only a handful of pages on World War II.

(*INSTRUMENT FLYING continued from page 11*) confined to daylight visual observation. Day and night aerial photography only recently has been established as a practical use of Army aviation. In the near future, reconnaissance and surveillance in Army aircraft will be conducted "around–the–clock" over a wide area, using various types of airborne intelligence gathering devices. Army pilots will fly at night and in the overcast. Army aviation transport units, either helicopter or fixed wing, when conducting tactical aerial mobility and aerial supply operations, will fly under conditions which afford the maximum security and surprise.

The Army has been mindful of its future needs for instrument qualified aviators, hence the present instrument flying program. Concurrently with the pilot training program, there are many development projects to provide the Army with equipment necessary to conduct future operations. This includes aircraft, navigation, and surveillance devices. Intensive work is also in progress to develop the tactics and technique of accomplishing these future operations. There are several activities of Army aviation in the near future which appear very evident: one of them is instrument flying.

Grey Hare Says

H–19 Rough Ride

An H–19 took off from a mountain top and, according to the pilot, suffered a tail rotor drive shaft failure about four minutes later. The failure occurred about the time that the pilot entered instrument flight conditions. At the time of the failure, the helicopter was flying through cumulo–nimbus type clouds. Turbulence contributed to the difficulty in controlling the disabled machine. The engine was allowed to over–rev, and the pilot lost all control with violent maneuvers resulting. During these violent maneuvers the tail rotor boom was torn from the aircraft. The H–19 was seen to come diving out of the clouds.

At this time the pilot brought the aircraft under control, and began a normal autorotation. The pilot elected to fly a rectangular pattern with intentions of landing to the west;

The Grey Hare Department is prepared monthly by the Camp Rucker, Alabama, Post Safety Director, Mr. William R. Gaines, with information obtained from the files of the world-wide aircraft accident safety review board. The views expressed in this department are the author's and are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor

Figure 1

and he undershot the field and crashed in a small ravine. The Accident Investigation Board listed the pilot's errors as follows: "a. Attempting take–off under unfavorable conditions; b. Entering instrument flight conditions or approaching same when ship was not properly equipped nor the pilot so trained; c. Attempting a rectangular pattern with a disabled aircraft in preference to a "straight–in" approach when the latter would have insured making the field, if not negotiating a successful landing."

From reading this accident report, it appears that the Accident Investigation Board placed the blame squarely where it belonged. This accident cost $30,000 and it could have been prevented if the pilot had not attempted instrument flight without proper training.

Masterpiece of the Year

Note in figure 1, above, that the L–23 is resting on the main gear and the tail skid only. According to regulations, an aircraft accident is classed as such only when $50 or more damage is involved, or when personal injuries occur. The L–23 in this picture was landed "wheels up," and the only damage done to the aircraft was the breaking of the antenna arm on the bottom side of the fuselage. Result? No accident.

The pilot of this aircraft experienced material failure when the nose wheel would not extend beyond the half–way position. The pilot elected to make a wheels–up landing on

a hard–top runway to minimize damage to the aircraft. He flew around the field for a considerable time, burning up fuel aboard the plane. While making the turn on his base leg, the right propeller was feathered, ignition switches and fuel valves were turned off. About 100 yards short of the runway the left propeller was feathered; all ignition switches and fuel valves were cut off; and a check was made to insure that the props were in a position where they would not strike the runway upon landing. All electrical switches in the aircraft were turned off, and a flare–out was made as in a normal landing. Immediately upon touching the runway the nose wheel further collapsed, allowing the aircraft to settle on the main wheels, which were retracted, and the tail skid. The pilot applied brakes lightly as needed to maintain directional control and avoided striking the runway with the nose of the aircraft. After sufficient speed was lost, brakes were used to stop the aircraft short of the runway. Immediately upon stopping, the pilot and two passengers evacuated the aircraft through the door which had been opened prior to landing.

It is a pleasure to write an article such as this where the pilot's judgment and skill were beyond reproach. We most assuredly consider landing an L–23 with wheels up, and doing less than $50 damage to the aircraft, the masterpiece of the year. Grey Hare's hat is off to the pilot of this aircraft.

It's The Way You Look At It

A pilot on a recent H–13 night flight made an approach in the traffic pattern to a point approximately 100 yards short of his designated landing point. He was behind another helicopter which had made a normal approach to a flashlight and flare pot. While hovering behind the leading helicopter, the second pilot experienced the sensation that he was moving forward in a nose–low attitude. He abruptly pulled back on the cyclic, causing the tail rotor and the rear of the skids to be driven into the ground. There were no injuries, although damage to the H–13 amounted to $3300. The pilot suffered an illusion induced by staring at the light on the aircraft ahead of him. There are two mistakes involved: first, avoid making abrupt movements of the cyclic control; and, second, peripheral vision must be developed to aid the pilot in maintaining orientation.

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Captain Weyman S. Carver

ASSISTANT EDITOR-IN-CHIEF
Captain Richard W. Kohlbrand

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Manuscripts, photographs, and other illustrations pertaining to the above subjects of interest to personnel concerned with Army aviation are invited. Direct communication is authorized to: Editor-in-Chief, ARMY AVIATION DIGEST, Army Aviation School, Camp Rucker, Alabama.

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ARMY AVIATION SCHOOL CREST

When reproduced in full color, the colors red, blue, and yellow are used in the crest to indicate representation of all branches of the Army in The Army Aviation School. The school's aviation training mission is symbolized by the perched falcon denoting the art of falconry with its patient training of swift, keen birds for hunting. The mailed fist depicts the military ground arm which exercises the control, training, and direction of the flight.